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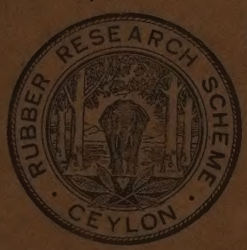

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CONTENTS

ORIGINAL ARTICLES

	Page
Artificial Rubber. By M. W. Philpott	1
Ceylon Clones—V. By C. A. de Silva ...	11
Notes on the Propagation of *Pueraria Phaseoloides*. By C. A. de Silva	16
Line Sites and Hevea Nurseries—A Warning. By Malcolm Park	19
Planting Notes. By T. E. H. O'Brien ...	22

MEETINGS ETC.

Minutes of the 36th and 37th Meetings of the Rubber Research Board	28

ARTIFICIAL RUBBER.

M. W. PHILPOTT,

ASSISTANT CHEMIST.

RUBBER growers have always been sceptical about synthetic rubber. The view generally held until a few years ago was that the large scale supplanting of natural rubber with its unique properties and low cost of production by a manufactured substitute was a contingency too remote for serious consideration. More recently it has become generally recognised that there have been developments in the production of synthetic rubber but the information available to the lay reader is mainly confined to newspaper paragraphs.* It is the purpose of this article to discuss the present position of the synthetic rubber question and to discover if possible the part which it is likely to play in the industry of the future.

Those who are familiar with the course of the rubber growing industry during the last thirty years will not need to be reminded of the frequency with which the "synthetic rubber bogey" has made its appearance. It would be interesting to know how often the announcement has been made that "the synthetic rubber problem has now been definitely solved". There is little doubt that these false alarms are mainly responsible for the lack of serious interest that rubber producers have usually shown in the past.

It is not easy to form a just estimate of the importance to be attached to the recent renewal of interest and activity in the production of synthetic rubber. Far reaching developments have been announced and claims of a definite and disquieting nature have been made; and while it is realised that the latter may not all be capable of substantiation it would be idle to pretend that the question has not been raised in the last year or two to a new level of significance.

The present status and future prospects of synthetic rubber cannot easily be gauged by reference to the reports that appear from time to time in the daily press. Not only are many of the statements obviously exaggerated or politically inspired but the opinions of even responsible and unbiassed commentators show a remarkable lack of unanimity. Eminent authorities can be

* See note on page 10.

quoted who hold that synthetic rubber is a serious menace to the plantation industry; others, equally eminent, on the contrary believe that synthetic rubber as a commercial proposition is a hopeless problem. In such circumstances it is thought desirable that the situation should be briefly reviewed in order to assist rubber growers to estimate the importance of synthetic rubber as a potential competitor of the natural product.

It may not be generally realised that although they possess rubbery characteristics the materials commonly spoken of as synthetic rubber are not true rubber. To the chemist the term synthetic rubber implies a material which is chemically identical with natural rubber in the same way that synthetic indigo, for example, is identical with natural indigo. In this sense the rubber hydrocarbon has probably never been synthesised. Even the isoprene polymers which are rubbery substances with the same fundamental hydrocarbon groupings as caoutchouc are not necessarily true synthetic rubbers. It is proposed therefore in what follows to refer to these rubber-like synthetic materials as artificial rubber.

It is now nearly sixty years since the chemist Bouchardat showed that it was possible to convert isoprene into an elastic solid possessing some of the characteristics of natural rubber. This discovery marked the beginning of a period during which numerous investigators were engaged in elucidating the scientific principles underlying the synthesis of rubber-like masses. It was the fundamental work of Harries in Germany on the constitution of caoutchouc and on the polymerisation of isoprene that laid the foundation of all subsequent investigation. Harries himself did not succeed in finding a solution to the problem of the technical production of artificial rubber from isoprene; this problem remained unsolved until 1909 when Hoffmann and his collaborators made a great advance by showing how isoprene and other butadienes could be polymerised by heat under comparatively mild conditions.

In the following year, 1910, the unprecedented demand for raw rubber resulting from the rapid development of the automobile industry caused a rise in the price of rubber. This provided a sharp stimulus to the production of artificial substitutes. Despite this economic encouragement, however, the artificial rubber industry made very little headway until the end of 1915 when it became a matter of national necessity for Germany to manufacture her own war-time requirements of rubber. It is

said that towards the end of the war a factory at Leverkusen was producing "methyl rubber"* at the rate of 150 tons a month. It is significant that at the end of the war manufacture in Germany ceased. The reason for this appears to have been twofold: the cost of manufacture was prohibitive and the product was very much inferior to natural rubber.

During the first ten years of the post-war period the attack on the problem flagged and it is not until 1929 that the patent literature affords evidence of a revival of interest on an industrial scale. The causes of the renewed efforts to manufacture rubber synthetically were first, the desire of the totalitarian states to make themselves independent or potentially independent of external supplies of so important a raw material: and second, the recognition that natural rubber is not really suited to many of the purposes for which, *faute de mieux*, it is commonly used. In Germany and Russia where activity has been greatest the new developments clearly have their roots in economic nationalism whereas in the Unied States emphasis has been laid more on the production of a material with improved properties.

It will be convenient to consider the different ways in which the artificial rubber problem has been attacked by describing the position in the three countries chiefly concerned, namely the United States, Germany and Russia.

It should be understood that only one of the products mentioned below (Neoprene) is commercially available outside its country of origin and that information regarding the other materials is based on reports in the scientific and industrial press.**

UNITED STATES OF AMERICA.

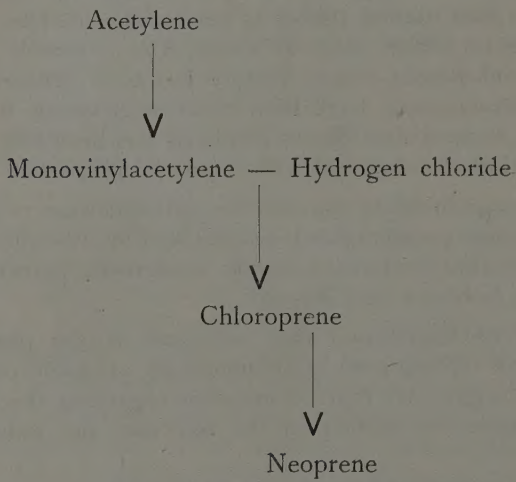
It has already been said that rubber has probably never been synthesised. The early experimenters, recognising that rubber bore a close chemical relationship to isoprene (2-methylbutadiene), at first directed their attention to this hydrocarbon in their efforts to produce a true synthetic rubber. In contemporary research, however, the attempt to duplicate synthetically the chemical constitution of rubber has been virtually abandoned

* Methyl rubber was prepared by the polymerisation of 2, 3-dimethylbutadiene, a methyl homologue of isoprene.

** In the present discussion the ethylene polysulphide products marketed under the name "Thiokol" are not included despite their possession of certain rubber-like characteristics. They are chiefly notable for their resistance to oils and other organic solvents, and their technical utilisation is likely to be confined to applications in which this property is of chief importance.

and efforts are being concentrated on the production of rubber-like materials which possess, if possible, better properties than natural rubber.

The American solution of the problem was heralded in 1931 by the discovery that an elastic solid of rubbery character is obtained by the polymerisation of chloroprene (2-chlorobutadiene). This material is now produced on a commercial scale by E.I. du Pont de Nemours & Co., Inc., and is sold in a free market under the name Neoprene.* The intermediate, chloroprene, is made by the addition of hydrogen chloride to monovinylacetylene which in turn is made by the polymerisation of acetylene. The course of the synthesis may be ideally represented as follows:—



From the apparent simplicity of this synthesis it might be inferred that Neoprene could be produced at a very low cost. At each stage of the synthesis however other reactions occur which tend to reduce the final yield of Neoprene and to form by-products for which there is at present no commercial demand. By close study of the reactions the yields of the process are being steadily improved; nevertheless the chemists of the Du Pont Co. state quite frankly that they believe Neoprene will never be as cheap to produce as natural rubber.

The properties of Neoprene have been described in considerable detail by competent technologists in all parts of the world and there is no lack of reliable data upon which to form

* Formerly Duprene.

a judgment. Neoprene is without question more resistant than rubber to oxidation and to the deteriorating action of oils and heat, and it is by virtue of these properties that it already occupies a position in industry. Typical examples of its applications are the manufacture of printers' blankets and hose for conveying oil and petroleum.

Another property in which Neoprene appears to excel natural rubber is abrasion resistance. It is stated that Neoprene tyre treads have been constructed which have wearing qualities about 20 per cent better than the best rubber treads. If this superiority is confirmed and maintained the ultimate replacement of large quantities of natural by artificial rubber in the tyre industry is a possibility to be reckoned with. At present the market price of Neoprene is about three to three and a half times that of smoked sheet* but even this disparity in price may not preclude the use of artificial rubber if it is capable of giving tyres with a proportionately increased mileage.

In two respects Neoprene compares unfavourably with rubber. It possesses a rather disagreeable odour which makes it unsuitable for personal and domestic articles, and the raw product toughens with age. This latter feature seems likely to raise a number of difficulties since the manufacturers accept no responsibility for Neoprene that has been kept on hand for more than 90 days. Under warm conditions of storage the toughening proceeds even more rapidly. The bearing of this factor on the marketing and export of the material is obvious.

Before leaving the subject of Neoprene mention should be made of "Neoprene Latex", an artificial latex which is made by the polymerisation of chloroprene in the form of an emulsion. The suspended Neoprene particles are said to be so highly polymerised that articles made directly from the latex require no vulcanisation. Another interesting fact about "synthetic latex" is that Neoprene in this form is cheaper to manufacture than in the solid form. The cost of natural rubber as preserved latex on the other hand is greater than the cost of dry rubber so that from the point of view of price Neoprene latex competes more favourably with rubber latex than does Neoprene with rubber.

GERMANY.

Information about the German production of artificial rubber is neither so definite nor so reliable as the information that has been issued regarding the American synthetic material. Most

* At the time of writing, the London price for sheet is 1s. 1d.

of the scientific and lay publications on the subject appear to emanate from inspired sources and to bear the stamp of political bias. Nevertheless there can be no doubt that in Germany the artificial rubber industry has already acquired national importance. Several grades of artificial rubber are being produced under the generic name Buna and each grade possesses certain specific properties to suit it to specific purposes. The starting material in all cases is butadiene and the various qualities of plastic material are produced by varying the method of polymerisation. For example, Buna 85 and Buna 115 are made by polymerising butadiene in the presence of metallic sodium. Buna N and Buna S on the other hand are formed by the polymerisation of butadiene in emulsion form together with other substances which modify the properties of the product. In the case of Buna N it is believed that the modifying substance is acrylic nitrile. No statement can be made about the preparation of the intermediate hydrocarbon, butadiene, as the literature does not make it clear which method, out of several possible ones, is actually in use.

To describe fully the properties which are claimed for Buna it would be necessary to refer to each grade separately. Probably the most outstanding member of the Buna group is Buna N. This is said to possess all the favourable qualities which were mentioned in connection with Neoprene: that is to say it is superior to natural rubber in its resistance to heat and oils and in its ageing qualities. The most significant claim however is made in connection with its resistance to abrasion. The laboratories of the I. G. Farbenindustrie have recently published figures which indicate that the abrasion resistance of Buna N is more than 60 per cent greater than that of rubber. In considering this figure it is necessary to bear in mind that abrasion resistance is a quality to which it is notoriously difficult to assign a numerical value. However it has also been claimed that Buna tyres give at least a third longer service than high grade rubber tyres under the same conditions.

Although the disadvantages of Buna are not emphasised in the published literature one gathers that it resembles Neoprene in not being free from a tendency to become very tough if kept for any length of time. How far this defect is likely to militate against the general utilisation of the material cannot be estimated in the absence of any indication of the magnitude of the change. Export difficulties, of course, do not arise since the consumption of Buna is at present confined to Germany.

The cost of production of Buna is believed to be between 3s. 6d. and 4s. 0d. but a Government subsidy enables the manufacturer to purchase the material under compulsion for about 3s. 0d. Price, however, is admitted to be of secondary importance in comparison with the saving in foreign exchange which results from the partial replacement of an imported commodity by a home-produced substitute. Even in a free market Buna, like Neoprene, would probably meet with a fair demand on account of its special properties.

RUSSIA.

The position in Russia is difficult to assess, not through any lack of published information, but because there is an inconsistency about many of the statements which come from Russian sources. Whatever doubts there may be regarding the methods adopted there can be no question as to the aims of the Soviet rubber plan which are to render the Russian rubber industry independent of outside supplies of raw rubber. According to the estimates made at the beginning of the 1933 to 1937 Five Year Plan Russia's requirements for the year 1937 are to be met as follows:—

Synthetic rubber ...	47,000 tons
Locally grown plant rubber	10,000 ,,
Imported Natural rubber	49,000 ,,
	106,000 ,,

A more recent report states that the planned production of synthetic rubber in 1937 is 70,000 tons. Whichever figure is nearer to the truth it is evident that developments have taken place on a far more ambitious scale in Russia than in America and Germany. The synthetic rubber-like materials which are receiving attention are:—

Sovprene — a polychloroprene analogous with Neoprene.

SKA & SKB — butadiene polymers of the Buna type.

Most of the present output of artificial rubber is made from alcohol by the SKB process. Alcohol is first converted by high temperature cracking to butadiene, and the latter is then polymerised with metallic sodium. According to figures taken from the Russian technical literature on the subject it appears that the yield of artificial rubber from 100 lbs. of alcohol is less than

30 lbs. Ethylene, grain and potatoes have been suggested as sources of alcohol and it is believed that at present the production of SKB rubber is entirely from potato alcohol.

No information about costs is available but it is evident from the known details of the process that the cost must be very high in relation to that of natural rubber. Such a comparison, however, is from the Soviet point of view, quite irrelevant since the immediate object of artificial rubber production is to save foreign exchange by the curtailing of imports.

It is remarkable that although there exists a comprehensive and detailed scientific literature on Russian artificial rubber production, no definite quantitative data on the physical characteristics have yet been published and so far as is known no samples of the product have been examined outside the Soviet Union. It is perhaps significant that the manager of the Soviet rubber factories admits that efforts are being made to improve the product "not because the quality of the present rubber is bad, but because it might be better".

THE FUTURE OF ARTIFICIAL RUBBER

To what extent, then, is artificial rubber a potential competitor of plantation rubber ? Any answer to this question must take into consideration the three factors of quality, price and political exigency. In connection with quality it has been shown that raw rubber is no longer to be regarded as a material which cannot be improved upon. Already synthetic materials are being manufactured which for some purposes are superior to the natural product and it is reasonable to suppose that the active research which is being carried on in America, Germany and elsewhere will result in further improvements being made.

Closely allied to the question of quality is that of uniformity. Rubber, on account of its biological origin, is subject to wide variations in physical properties which are a source of many difficulties to the manufacturer. Much can be done to improve the uniformity of plantation rubber but it will never be practicable to attain the high degree of uniformity which is possible with a purely chemical product.

On the question of cost all that may be said with certainty at present is that the cost of production of rubber is far below that of any of the competitive products. It would be extremely difficult to give a justifiable estimate of the exact relation between

the two costs. Not only is our knowledge of the cost of artificial rubber very uncertain but even the cost of production of natural rubber might be discussed at length without reaching a conclusive answer. We do know, however, that the *selling price* of American chloroprene rubber is of the order of 3s. 0d. per lb.; and we believe many rubber growers would be prepared to agree that plantation rubber can be produced profitably when the world price is 8d. or 9d. *i.e.*, one quarter of the present price of artificial rubber. It would not be justifiable to infer that the *costs* of the two products are related in a similar ratio since it is conceivable that the manufacturers of the synthetic materials may be producing at a loss in order to establish the industry.

How long the difference in cost, whatever it may amount to, will be maintained depends mainly on the rate of technical progress that can be achieved in the processes used in the manufacture of the synthetic materials and to a smaller extent on the increasing efficiency of production of natural rubber which must result from the more widespread use of high yielding planting material. The possibilities of reducing the cost of manufacture of the synthetic materials appear to lie chiefly in the direction of finding profitable outlets for the inevitable by-products and it is understood that a considerable amount of attention is being given to this problem. All competent authorities seem to be agreed, however, that it is very improbable that any synthetic rubber-like material will ever be produced as cheaply as natural rubber.

Finally there are the political factors. In Germany and Russia* thousands of tons of synthetic rubber-like materials are being produced in order to save foreign exchange and because it is realised that in time of war external supplies of raw rubber would be curtailed. In these countries price is of secondary importance compared to the availability of supplies and the development of the synthetic processes is not affected by the high relative cost of the product. Even in Great Britain the establishment of artificial rubber factories has been urged as a means of acquiring the necessary technical knowledge to enable the industry to be expanded in case of national necessity.

If we accept, as we must, these politico-economic facts on the ground that they are beyond our control, the rubber grower's problem, reduced to its simplest terms, is how to maintain and

* Efforts are also being made to manufacture artificial rubber on a large scale in Japan (now the world's third largest consumer of rubber) and to a smaller extent in Italy and Poland.

expand the free demand for natural rubber in the face of the competition which has been introduced by the advent of substitutes of good quality but high cost.

The best means of arresting this incursion of competitive products into the industry lies in the improvement of natural rubber to a point at which it possesses fewer quality disadvantages in comparison with synthetic materials. The abrasion resistance of rubber, for example, its uniformity and its resistance to the deteriorative action of oils and oxidation are qualities which, it is reasonable to believe, can be improved by consistent and co-ordinated research. Work on chemically modified rubbers and new uses has been in progress for some time and it is important that this type of investigation should be continued and extended; but the maintenance of rubber in its existing uses is a subject which hitherto has not perhaps received the attention it deserves.

NOTE.

When the above was written in March, 1937 little or no information had been issued which was both up to date and authoritative. Since that time, however, several valuable contributions to the literature on the subject have been published. Particular reference should be made to "Synthetic Rubber" by W. J. S. Naunton (Macmillan, 7s. 6d.) in which the subject is discussed more fully than in the present article.

CEYLON CLONES—V.

C. A. DE SILVA,

ASSISTANT BOTANIST.

FOREWORD

IN continuation of previous reports on the test-tapping of Ceylon clones, the following article presents data for 1936.

Acknowledgment is made to the under mentioned proprietors who have kindly given permission for the publication of the records of clones established from mother trees on their properties:—

The Govinna Rubber Co., Ltd.

The Lavant Rubber Co., Ltd.

The Mirishena (Kalutara) Rubber Co., Ltd.

The Dimbula Valley (Ceylon) Tea Co., Ltd.

The Rosehaugh (Ceylon) Rubber Co., Ltd.

The Gallawatte (Ceylon) Rubber Co., Ltd.

The Tempo Tea and Rubber Co., Ltd.

The Beau Sejour Rubber Co., Ltd.

PRESENTATION OF RESULTS.

The presentation of data is in the same form as 1935. Table I gives the average yield figures for the year per tree, per tapping and the actual total yield per tree in lbs. Calculated figures for 130 tappings on the half spiral alternate day system at different ages are shown in Table II and the graph.

The yield figures are, in general, disappointing and it is only intended to comment briefly on clones which show features of special interest.

Millakande 3/2.—The yield of the clone at Nivitigalakele is again outstanding, and the results from Millakande Estate show a very satisfactory increase on last year's figures considering the comparatively lower level of growth.

Hillcroft 28.—Three trees in the original test-tapping group developed brown bast early in the year and 3 new trees were included in the group. The tapping system was altered to a half spiral cut every third day. The reduced yield of the group appears to be due to the milder tapping system and the lower yield of the new trees.

The second group of trees which was previously tapped on the "double 4" system was also put on to 3 day tapping, subsequent to the development of brown bast in three of the trees. Five new trees were added to the group.

Test-tapping results for 6 year old trees at Millakande and Nivitigalakele are relatively satisfactory, but it seems clear that the clone has a tendency to brown bast which will have to be met by the adoption of a milder tapping system than a half cut on alternate days.

Hillcroft 55.—The tapping system has been the same as last year, a single half spiral cut every third day. The average yield per tree per tapping shows a decided improvement on last year's figures and the increase in the total yield per tree is very satisfactory. The total yield of 5.3 lbs. per tree at Millakande in the 6th year tends to confirm the high yielding qualities of the clone.

Clone	Where tapped	No. of trees	Average Age years on 1/7/36	Average Girth ins at 3 ft.	Avera 1933	1934	1935	Jan.	Fe
Govinna 771 (A)	Nivitigalakele	12	9	30·8	16·2	25·4	30·3	33·4	32
Ditto (B)	Ditto	11	9	25·0		16·2	18·3	21·7	20
Ditto (C)	Ditto	8	8	27·0		16·7	20·5	21·3	18
Ditto (D)	Ditto	8	8	25·3		29·7	38·1	57·4	48
Lavant 28 (A)	Ditto	12	8½	32·3	10·6	19·2	28·8	27·3	25
Ditto (C)	Ditto	10	7	27·8		9·7	16·6	17·5	14
Ditto (D)	Ditto	10	7	29·0		17·0	38·2	61·9	56
Eladuwa 1	Ditto	12	7½	30·6	9·2	17·8	19·1	25·0	19
Millakande 3/2	Ditto	12	6	27·5		10·7	21·1	23·3	19
Ditto	Millakande	10	7	24·5			13·7	17·3	22
Millakande 1/1	Ditto	10	7	22·0			15·3	17·1	21
Ditto	Nivitigalakele	9	6	18·5					
Heneratgoda 2 (A)	Nivitigalakele	12	9	27·1		10·7	18·4	19·4	13
Ditto (B)	Ditto	10	9	25·0		9·9	16·0	17·6	13
Cuilcagh 4	Ditto	11	8	30·0	8·4	14·1	21·1	20·8	14
Cuilcagh 5	Ditto	12	8	25·8		6·9	20·5	25·4	17
Hillcroft 28	Stenness	9-12	10	35·0	46·7	60·9	69·3	77·1	
Ditto	Ditto	7-12	10	31·6			73·7	101·7	
Ditto	Millakande	10	6	23·5					
Ditto	Nivitigalakele	10	6	22·3					
Hillcroft 55	Stenness	9	10	34·3	49·1	53·3	55·3	74·4	
Ditto	Millakande	10	6	20·5			10·4	13·3	9
Gallawatte 2	Gallawatte	10	8	29·5		17·8	22·1	25·8	
Gallawatte 24	Gallawatte	10	8	28·6		17·9	20·9	23·3	
Beau Sejour 3	Nivitigalakele	10	6	19·0					

½ sp.a.d. = ½ spiral alternate day

½ sp.3.d. = ⅓ spiral every three da

D/4 = Double four tapping e
on two opposite half s

* Tapped on alternate day half sp

† Tapped on double four in Janu

E I.

yield in grams dry rubber per tree per tapping										Tapping system	No. of tappings	Actual Yield per tree in lbs.
Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	1936			
	25·7	31·2	31·6	32·2	32·6	36·1	37·4	35·3	34·5	32·9	½sp.a.d.	127	9·2
	15·9	16·1	18·2	17·5	20·0	21·9	23·5	22·0	23·9	20·2	do	127	5·6
	14·9	16·2	20·0	19·2	21·2	25·1	26·8	28·3	28·6	21·9	do	126	6·1
	23·5	22·0	30·9	30·1	37·6	51·1	57·1	64·2	63·9	44·3	D/4	67	6·5
	22·9	25·4	27·3	28·5	28·7	31·8	31·4	30.9	29'8	28·1	½sp.a.d.	127	7·9
	12·4	11·9	16·6	19·3	20·9	20·4	27·4	25·0	24·8	19·3	do	126	5·4
	28·4	28·9	37·4	40·3	44·9	55·9	70·9	79·3	70·9	52·4	D/4	67	7·7
	15·7	15·6	22·5	23·9	28·4	24·5	31·1	31·3	28·7	24·7	½sp.a.d.	125	6·8
	21·7	27·4	33·2	31·6	28·4	32·7	39·9	43·0	33·4	30·4	do	127	8·5
	13·7	18·8	29·4	23·5	20·5	22·2	27·2	28·9	28·8	23·0	do	137	6·9
	18·1	17·3	21·9	19·2	17·9	22·3	28·3	27·8	29·9	22·0	do	138	6·7
	11·8	10·7	13·4	17·6	16·7	15·8	15·2	19·6	20·2	15·9	do	104	3·6
	15·2	17·1	19·5	19·3	22·5	26·0	28·5	31·5	25·2	21·8	½sp.a.d.	127	6·1
	14·0	16·4	19·8	17·7	17·2	23·6	24·9	27·6	20·9	19·4	do	127	5·4
	19·2	18·9	24·0	25·8	30·8	29·4	30·1	27·2	26.6	24·6	do	127	6·9
	16·3	19·6	23·2	21·9	23·5	23·7	27·9	24·6	24·8	22·9	do	126	6·3
	54·3	60·3	64·8	50·3	67·0	74·4	58·2	58·7	73·9	64·5	½sp.3d.*	85	11·6
	49·3	49·7	59·4	42·1	63·4	67·5	53·4	56·3	70·6	58·7	½sp.3d.†	76	9·4
	14·3	13·4	30.6	22·4	25·1	24·5	25·0	27·5	23.3	23·1	½sp.a.d.	116	5·9
	8·3	9·3	10·8	10·1	14·2	15·8	21·4	23·1	24·6	15·5	do	102	3·5
	60·3	60 2	75·3	53·8	61 1	72·0	58·7	69·7	86·7	67 6	½sp.3d.	79	11·8
	23·7	11·1	24·2	15·1	16·5	17·8	19·3	18·5	18·8	17·6	½sp.a.d.	136	5·3
11·4	18·7	25·6	26·7	28·4	28.2	27·8	22·3	24·7	25·8	24·6	do	130	7·0
12·8	15·3	20·8	19·4	20·8	20·3	20·7	16·8	19·5	19·5	19·1	do	131	5·5
	5·7	9·2	10·9	8·8	16·5	19·3	19·1	17 2	15·0	13·5	do	102	3·0

.
ry four days
iral cuts.
ral in January
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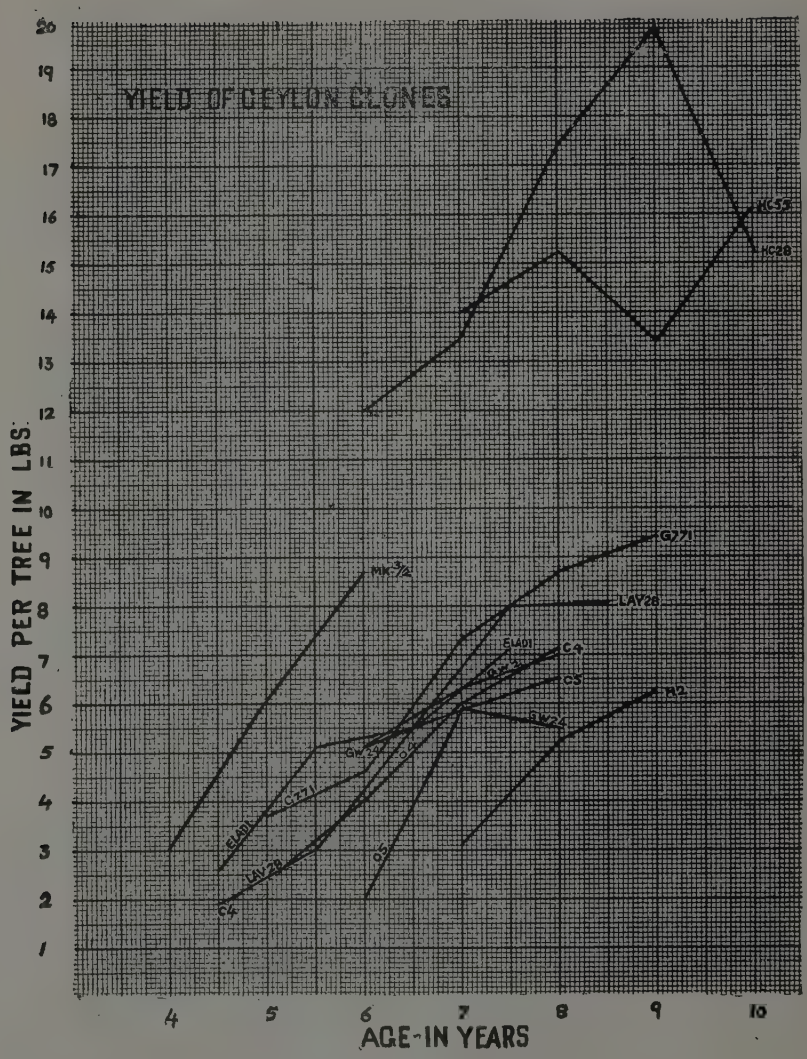
TABLE II.

Clone	No. of trees	Calculated yield in lb. per tree for 130 tappings on ½ spiral alternate day at ages of (to nearest half year)																	
		4		4½		5		5½		6		6½		7		7½		8	
Govinna 771 (A)	12					3·7				4·6				7·3				8·7	
Do (B)	11													4·6				5·2	
Do (C)	8-9									4·7				5·9				6·3	
Do (D)	8-10									4·2				5·5				6·3	
Lavant 28 (A)	12			1·9				3·0				5·5				8·0			
Do (C)	10					2·8				4.7				5·6					
Do (D)	10					2·4				5·5				7·5					
Eladuwa I	12			2·6				5·1				5·5				7·1			
Millakande 3/2	12	3·0				6·0				8·7									
Do	10									3·9				6·5					
Millakande 1/1	5-10									4·3				6·3					
Do	9									4·5									
Heneratgoda 2 (A)	12													3·1				5·2	
Do (B)	10													2·8				4·6	
Cuilcagh 4	12-11					2·4				4·0				6·0				7·1	
Do 5	12									2·0				5·9				6·5	
Hillcroft 28	9-12									12·0				13·4				17·4	
Do	7-12																		
Do	10									6·6									
Do	10									4·5									
Hillcroft 55	9													14·0				15·	
Do	10					2·6				5·1									
Gallawattc 2	10									5·1				6·3				7·0	
Gallawatte 24	10									5·1				5·9				5·5	

Clone	8½	9	9½	10
Govinna 771 (A)		9·4		
Do (B)		5·7		
Do (C)				
Do (D)				
Lavant 28 (A)	8·1			
Do (C)				
Do (D)				
Eladuwa I				
Millakande 3/2				
Do				
Millakande 1/1				
Do				
Heneratgoda 2 (A)		6·2		
Do (B)		5·5		
Cuilcagh 4				
Do 5				
Hillcroft 28		19·8		15·2
Do		12·7		13·4
Do				
Do				
Hillcroft 55		13·4		16·1
Do				
Gallawattc 2				
Gallawatte 24				


YIELD OF CEYLON CLONES
YIELD PER TREE IN LBS.
AGE-IN YEARS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
4
5
6
7
8
9
10
RCS5
HC28
G771
LAV28
MK3/12
ELA01
C9
C5
R2
SWR25
SWR3
SWR4
SWR1
C2
LAV28
ELA01
G771
C5

NOTES ON THE PROPAGATION OF *PUERARIA PHASEOLOIDES.*

C. A. DE SILVA,

ASSISTANT BOTANIST.

THE value of ground cover on Rubber estates as a means of preventing soil erosion and improving soil conditions has been recognised in Ceylon for a number of years. Vigna (*Dolichos Hosei*) was planted extensively on estates some years ago and good covers were obtained, but experience has shown that the species is not sufficiently robust to persist under the shade of mature Rubber without periodical manuring. The heavy covers which existed on many estates before the slump period have now deteriorated in most cases to a straggling growth which is inadequate for the protection of the soil.

Pueraria phaseoloides is a more vigorous species which appears capable of persisting in mature Rubber areas and has been planted extensively on estates in the past 2 or 3 years. It was decided to establish a cover of Pueraria on Dartonfield Estate in 1936, and the opportunity was taken of comparing different planting methods. A résumé of the trials is published as being of practical importance to producers.

Beds 3 feet square were cut centrally between each four trees, well forked and surrounded by a drain to exclude Rubber roots as far as possible. The drains were periodically cut with alavangoes for the same purpose.

The following methods of propagation were used:—

i. Marcotted cuttings.

ii. Seed grown in coconut husks.

iii. Direct seed distribution.

The first method is only applicable if the species is already established on or close to the estate. In this case the cuttings were raised at Nivitigalakele about 5 miles distant from Dartonfield.

The method of marcotting was to apply a mixture of good earth and a little cattle manure to fairly mature stems near the root nodes, tied in position with pieces of sacking (old manure bags if available). If this is done at the beginning of the wet season, rooting occurs in 4-6 weeks and the stems can be cut and planted out as rooted cuttings.

For the second method seedling plants were established in coconut husks laid on the ground under a cadjan shelter. The husks were packed with good soil and a little cattle manure, and a few seeds planted in each. The development of the plants was very satisfactory except for damage caused by snails. The use of a poison bait made of sodium arsenite and lime proved effective in preventing these attacks. After three months, the plants showing good growth were transferred with the husks to the prepared beds in the field.

The direct distribution of seed was carried out by dibbling in a small quantity of seed in each bed in the field.

The following manure mixture was applied to the beds about 3 months after planting, to accelerate growth and stimulate backward plants:—

Bone meal ...	3 parts
Saphos phosphate	2 ,,
Nitrate of potash ...	1 part
Nitrate of soda ...	1 ,,

The quantities used were $1\frac{1}{2}$ ounces and 3 ounces per bed, according to the method of propagation and the requirements of the plants. The bigger dose of 3 ounces is recommended as a standard dressing and can be repeated as required. When the plants begin to spread beyond the beds, an application of mineral phosphate at the rate of 100 lbs. per acre would assist considerably in establishing the cover.

A general survey of the cover of Pueraria on the estate shows that the best methods of propagation are by marcotted cuttings and seedling plants in husks. The former is the more satisfactory and should be adopted where possible. Seeds distributed directly in the prepared beds germinated quite well but subsequent growth was unhealthy and, presumably owing to a poorly developed root system, the plants failed to respond to manuring.

Approximate costs per acre for the three methods of propagating the cover, are as follows:—

	Marcots	Planting in husks	Direct seed distribution
	Rs. cts.	Rs. cts.	Rs. cts.
Beds (100 per acre)	95	95	95
Repairs to beds	20	20	20
Planting material	1 70	80	25
Planting	50	50	25
Manuring	80	80	80
	4 15	3 25	2 45

LINE SITES AND HEVEA NURSERIES — A WARNING

MALCOLM PARK,
MYCOLOGIST, DEPARTMENT OF AGRICULTURE, CEYLON.

THE policy of replanting is being considered and adopted on a number of old rubber estates in Ceylon. One of the first requirements in the execution of this policy is the establishment of nurseries for seedlings and for young budded plants. The selection of nursery sites often presents difficulties on a fully-planted estate. To be satisfactory, a nursery site should be on relatively flat land and should be conveniently near a regular water supply. To a planter searching for a suitable place for a nursery, the presence of an old line site offers considerable attractions; it is flat, it usually has a water supply laid on or conveniently near at hand and, further, it can be converted into a nursery without having to uproot many rubber trees. This note is written with the object of drawing the attention of planters to the danger of using such sites without taking suitable precautions.

Tropical plantation crops, such as Tea and Rubber, are intolerant of alkaline soil conditions. This intolerance is particularly marked in young seedlings, which develop typical symptoms of distress in alkaline soils. The root development of the plants is poor while the leaves become chlorotic and do not develop the normal green colour. The chlorosis in the first stages takes the form of a variegation in which the veins are green while the remainder of the leaf is yellow, giving a mosaic-like pattern. In later stages, the green colour is completely lost and the young shoots are yellow with small, atrophied leaves. The appearance of these young shoots has been aptly described by a planter whose nursery has suffered as 'miniature asparagus tips'.

The soil around old line sites is often alkaline in reaction. Among the causes of this are probably the admixture with the soil of lime mortar when walls are demolished, the effect of

ashes and waste foods thrown on the soil by the inhabitants of the lines and the improper use or disuse of latrines and the consequent liberation of ammonia, which is strongly alkaline, in the soil surrounding the line. In a nursery situated on an old line site, it was found that the soil was decidedly alkaline (pH 8.2) whereas the normal soil was acid (pH 5 to 6). In consequence, many of the plants failed to grow normally and developed the symptoms described above.

In selecting places for nurseries, therefore, line sites should be avoided if possible. It is, however, possible to treat the soil in order to render it more acid. This has been shown by the Tea Research Institute to be possible and practicable under local conditions. A heavy dressing (10 cwt. per acre) of flowers of sulphur has been shown to make the necessary alteration in the reaction of the soil. Sulphur is acted on by sulphur bacteria in the soil and converted into one or more of the sulphur acids which in turn neutralise the alkaline conditions. The process is, however, a slow one and a period of at least six months must elapse before a marked change is noticeable. If, therefore, it is proposed to establish a Rubber nursery on an old line site the sulphur treatment should be undertaken at least six months before the nursery is planted.

Soils in Ceylon tend to become acid and it is possible that the soil of a long-disused line site may have become less alkaline than that of a site recently vacated. Given suitable apparatus, the testing of the reaction of soil is a relatively simple matter and it is suggested that planters contemplating the establishment of nurseries on old line sites should send in to the Rubber Research Scheme Laboratories, Dartonfield Estate, samples of soil from different parts of the area. Samples should be selected by thoroughly mixing the soil within an area of not more than 1 square yard to a depth of about 1 foot and collecting a cigarette tin full of the mixed soil. Five or six samples should be collected from different points in the nursery and each marked clearly so that its location can be easily determined. The soil of such an area would not necessarily be uniform and treatment of the whole might not be necessary.

There remains the question of the treatment of nurseries already established on line sites and in which ill-effects are apparent. The sulphur treatment which is the most effective and permanent treatment is slow in action and a considerable set-back to the plants will take place before its beneficial effects

are fully felt. A dressing of flowers of sulphur should, however, be applied at once. Coupled with this the application of an acid-forming, quick-acting manure like sulphate of ammonia will be beneficial. The manure should be applied at the rate of 2 cwt. per acre and its effect will be more rapid if it is applied in solution. If sulphate of ammonia is dissolved in water at the rate of 3 oz. in 4 gallons and the solution applied at the rate of 1 gallon per square yard; it will be found that the manure will be applied at approximately 2 cwt. per acre. The solution should be applied immediately round the plants rather than generally over the soil.

If no marked improvement is noted after one month the dose should be repeated. In addition to correcting the reaction of the soil, the sulphate of ammonia will, of course, have a beneficial manurial effect.

PLANTING NOTES.

T. E. H. O'BRIEN

DIRECTOR.

STUMPED BUDDINGS.

SEVERAL enquiries have been received recently regarding the use of stumped buddings as planting material with a view to minimising the period during which replanted areas remain unproductive. In this method of planting seedling stocks are budded in the nursery, cut back to allow the budshoots to grow, and transplanted to the field at a stage when the scions can be stumped in brown wood at a height of 6-8 feet, usually about 18-24 months after budding.

The method has been used experimentally by the Research Scheme on an increasing scale since 1933 for supplying vacancies and no serious drawbacks have been observed up to the present. An experiment was laid out in 1936 to compare 3 planting methods, viz: seed at stake for subsequent budding in the field, dormant budded stumps, and stumped buddings. Approximately 400 stumped buddings were planted out without a failure and are growing well. The criterion of comparison beween the methods will be the time taken by the plants to reach tappable size. The results of the experiment, naturally, cannot be predicted but there are indications from general observations that stumped buddings may show an advantage of 6 months growth over dormant stumps and 12 months over seedlings. The Research Scheme is not in a position to make a definite recommendation in favour of planting with stumped buddings but it is considered that the method could be utilised without undue risk in view of the desirability of retaining existing stands of trees in tapping for as long as possible while the price level is favourable.

In order to prepare stumped buddings for planting in 1940 it would be necessary to lay down nurseries this year. A nursery layout which is considered suitable is to space the rows 18 inches apart and plant at 18 inch intervals, on the quincunx system, so that the position of the plants alternates in adjacent rows. Three germinated seeds should be planted at each point,

at the corners of a 4 inch triangle and the 2 weaker plants thinned out before the stage of budding is reached. The beds should be thoroughly forked over before planting the seed and all roots down to the thickness of a pencil removed in order to prevent any risk of the spread of root diseases. Holes should be cut 2 feet deep and loosened to a further depth of 1 foot at each planting point as it is essential that scope should be given for good tap-root development. Initial growth in the field depends largely on the food reserves which have been built up in the plants, while in the nursery. It is, therefore, advisable that a liberal cultivation policy should be followed.

The suggested nursery spacing provides for a theoretical stand of 19,300 plants per acre but the provision of drains and paths will reduce the number to about 14,000. Allowing for casualties the nursery space required is thus slightly over 1 per cent of the area to be planted. An alternative to nursery planting would be to open up an appropriate area of suitable land on the contour trench system, digging continuous trenches and filling in with the best top soil available and planting seed at a spacing of 18 inches apart in the trenches. The surplus plants would later be transplanted as stumped buddings, leaving the area with a normal stand of trees per acre.

TRANSPLANTING DORMANT BUDDED STUMPS.

Another subject on which information is frequently requested is the procedure to be adopted in planting out dormant budded stumps. The method formerly followed by the Research Scheme was to stump the plant at a height of 3 feet at the time of transplanting and allow stock shoots to grow for several weeks before finally cutting back the plant to force the bud to shoot. This method had the advantage of limiting the number of casualties if dry weather occurred after planting but it was found that there was a tendency for sprouting of the buds to be delayed after the final cutting back and that a proportion of the stumps remained dormant and had to be replaced.

The procedure now adopted is to ring-bark the plant in the nursery about 8 inches above the bud-patch, 7-10 days before transplanting. This gives the bud an initial stimulus to sprout before the root system is disturbed. At the time of transplanting the stock is cut off with a sloping cut six inches above the bud-patch. (In the case of small stocks ring-barking can be done at 6 inches and stumping at 4 inches above the bud-patch). The stump is carefully removed without causing damage to the tap-root or side roots. If pruning of side roots

No. 1. General appearance of cattle bridge

No. 2. Bull leaping over cattle bridge

is unavoidable it should not be done within 12 inches of the plant. The cut end of the stock is then painted with (or dipped in) melted grafting wax to prevent loss of moisture and the plant transferred to the field with as little delay as possible.

TAPPING

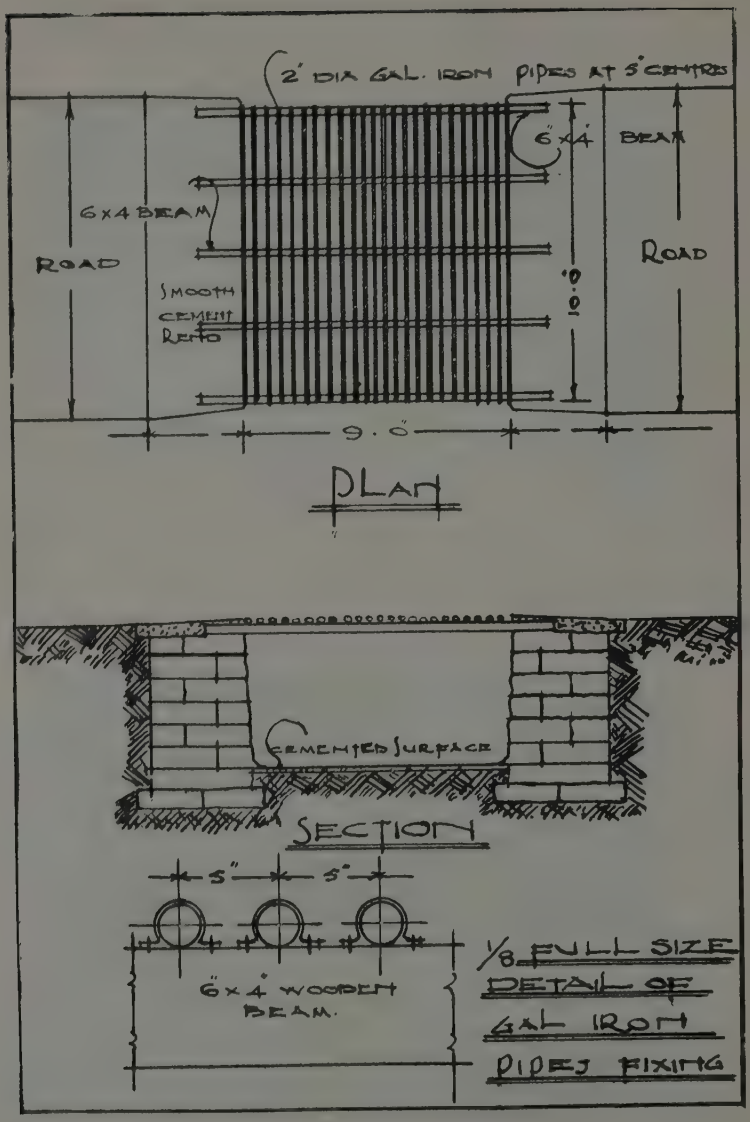
In the report on Mr. Murray's recent tour of Malaya, Sumatra and Java (Rubber Research Scheme Bulletin No. 54) it is stated on page 35 that tapping in other countries seems to be rather deeper than in Ceylon, shallow tapping being condemned as much as, or more than, the making of wounds. Generally speaking tapping in Ceylon is very good from the point of view of freedom from wounds but it is believed that there are grounds for the criticism that crop is being lost owing to the cuts being too shallow. The latex cells are mainly situated in the inner cortex and the optimum crop can only be obtained by tapping to the maximum depth without wounding. The tapping cut should penetrate to within 1/20 inch of the cambium whereas it is frequently found on local estates that substantially more than this margin is allowed. It has been suggested that deep tapping leads to increased damage from bark rot but this view is not supported by tests in Malaya which are referred to by A. Sharples (Diseases and Pests of the Rubber Tree p. 246).

CATTLE BRIDGES.

Fencing of replanted areas to prevent damage by straying cattle leads to considerable inconvenience when an estate cart-road passes through such areas. Either the road must be fenced on each side or gates must be provided. The difficulty is overcome in cattle-breeding countries and to some extent in private parks by the replacement of gates by a type of road bridge with an open top which can be traversed by vehicles and pedestrians but is impassable to cattle.

A bridge of this type was recently constructed at Dartonfield and, while not entirely satisfactory, it has provided the experience on which suggestions can be made for the construction of suitable bridges. A brief description will be given of the bridge as constructed and features which require improvement will then be referred to.

The bridge replaced an existing culvert on a road 12 feet wide. Stone abutments were constructed 6 feet apart. Beams of milla wood 6 inches × 4 inches were laid across the abutments spaced 2 feet apart, and set in concrete. Lengths of



PLAN AND SECTION OF CATTLE BRIDGE

discarded water piping of $1\frac{1}{4}$ inch internal diameter, filled with concrete, were laid across the beams with a spacing of $2\frac{1}{2}$ inches between the pipes and secured by means of iron clips screwed to the beams.

The appearance of the bridge is shown in Plate 1 facing page 24. It has proved suitable for use by a 2 ton lorry and can be crossed by pedestrians without inconvenience. When a bull was driven up to the bridge it refused to cross but, when pressed, it jumped across, thus demonstrating that a 6 feet span is insufficient (see Plate 2). An attempt was made to remedy the defect by facing the tops of the abutments with smooth cement to give the visual effect of a greater span but the bull again jumped across, when driven to the bridge. It would, therefore, be advisable to increase the span to at least 9 feet, in addition to facing the abutments with cement. It is also suggested that the spaces between the pipes should be increased to 3 inches. A planter who has seen similar bridges in Australia considered that the pipes nearest to the abutments should be made to rotate but the writer does not favour this arrangement under local conditions owing to the risk to pedestrians.

The suggested construction of the bridge is shown in the accompanying diagrams and approximate costs of the necessary materials are given below. It need hardly be mentioned that the constructional details can be varied according to local requirements and the materials available.

Approximate Costs of Cattle Bridge 9 ft. × 12 ft.

	Rs.	cts.
Foundations. Stone paving.		
13 ft. × 1 ft. × 13 ft. = 169 c.ft. @ -/10 ...	16	90
Abutments in split stone.		
2 (12 ft. × 2 ft. × 2 ft.) = 96 c.ft. @ -/25 ...	24	00
Concrete and cement facing.		
2 (12 ft. × $1\frac{1}{2}$ ft. × 8 ins.) = 24 c.ft. @ -/60 ...	14	40
Milla posts. (6 ins. × 4 ins.)		
7 × 11 ft. = 77 ft. @ -/60	46	20
Pipes ($1\frac{1}{4}$ ins.)		
22 × 12 ft. lengths	—	—
Filling pipes with concrete mixture ...	6	00
Clips, etc.		
120 @ -/15	18	00
240 brass screws ($1\frac{1}{2}$ ins.)	4	20
Fixing pipes	5	00
Rs.	134	70

MESH FOR LATEX SIEVES.

In an article entitled "Latex Sieves" published in Rubber Research Scheme *3rd and 4th Quarterly Circular* for 1935, attention was drawn to the risk of copper contamination of raw rubber arising from the use of brass gauze in latex sieves. It was stated that the Research Association of British Rubber Manufacturers had asked that consideration should be given to the possibility of using alternative materials and a recommendation was made that brass mesh should be replaced by stainless steel or nickel. It was pointed out that the additional cost of using nickel gauze in place of brass would not exceed 1/50 cent per lb. of rubber. Trials made at Dartonfield since the article was published have shown that nickel is more durable than brass and the additional cost would, therefore, be less than that stated. In spite of the trifling expenditure involved it was observed during recent visits to a number of local estates that brass mesh was still being used in most of the factories.

On another page of this issue Mr. Philpott discusses the present position of artificial rubber in relation to the natural product and stresses the importance of improving the quality of plantation rubber. Removal of the risk of copper contamination represents one factor in such improvement and it is hoped that the use of nickel, monel metal* or stainless steel in place of brass gauze will soon become universal on local estates.

MEMORANDA ON PLANTING TOPICS

Typescript copies of the following memoranda may be obtained on application to the Rubber Research Laboratories, Dartonfield, Agalawatta:—

Notes on budgrafting procedure.

Manuring programme for replanted areas.

Contour lining and holing, and cutting of platforms, trenches and drains.

Nursery layout.

* Experiments carried out in Malaya have shown that this material is suitable for the purpose.

MEETINGS ETC.

RUBBER RESEARCH SCHEME (CEYLON).

Minutes of the thirty-sixth meeting of the Board of Management held at Dartonfield Estate, Agalawatta, at 10-30 a.m. on Wednesday, 20th January, 1937.

Present.—Mr. E. Rodrigo, C.C.S. (in the chair), Mr. I. L. Cameron, Mr. L. M. M. Dias, Mr. L. B. de Mel, J.P., U.P.M., Mr. George E. de Silva, M.S.C., Mr. F. H. Griffith, M.S.C., Mr. R. C. Kannangara, M.S.C., Mr. J. C. Kelly, Mr. F. A. Obeyesekere, Mr. J. L. D. Peiris, Mr. C. A. Pereira, Mr. B. M. Selwyn, Mr. E. W. Whitelaw and Col. T. Y. Wright.

Mr. T. E. H. O'Brien, Director, was also present by invitation.

Apologies for absence were received from Mr. C. H. Collins, C.C.S., and Col. T. G. Jayewardene, V.D.

1. MINUTES

Draft minutes of the thirty-fifth meeting which had been circulated to Members were confirmed and signed by the Chairman.

2. APPLICATION FOR GRANT FROM THE DEPARTMENT OF INDUSTRIES

A further letter from the Minister for Labour, Industry and Commerce regarding the conditions on which a grant for the purchase of machinery would be recommended, was considered. It was decided to inform the Minister that the Board would be prepared to provide facilities for training approved students in the use of the machinery within the limitations of its staff but if further facilities are required, the necessary funds would have to be provided for maintaining an increased staff.

3. ACCOUNTS

(a) *Statements of Receipts and Payments of the Board and the London Advisory Committee*—for the quarter ended 30th September, 1936 were adopted.

(b) *Dartonfield and Nivitigalakele Accounts*—for September, October and November, 1936, were tabled.

(c) *Supplementary Votes.*

The following supplementary votes were approved:—

1936—Books and Periodicals	...	Rs. 100
Botanical Laboratory	...	,, 800
1937—Telephones ...	...	,, 125
Entertainment of Visitors	...	,, 300

(d) *Fixed Deposits.*

Renewal of the following deposits was reported:—

1. Rs. 50,000 at the National Bank of India, Ltd., for one year at 2 per cent. interest.
2. Rs. 25,000 at the National Bank of India, Ltd., for one year at 1¾ per cent. interest.

4. STAFF

(a) *Leave for Botanist and Mycologist.*—Application from Mr. R. K. S. Murray for period of leave to be extended to October 4th, 1937, was approved.

(b) *Advisory work during the absence of Botanist and Mycologist.*—The Chairman reported that arrangements had been made for the Government Mycologist to deal with advisory work on mycological subjects during the absence of Mr. Murray. A basis of remuneration for these services was approved.

(c) *Report on a Visit to Malaya and Netherlands East Indies.*—The Chairman stated that Mr. Murray's report on his tour had been submitted and would be circulated to members in time for consideration at the next meeting.

5. EXPERIMENTAL COMMITTEE

The following decisions were reached regarding recommendations of the Experimental Committee:—

(a) *Nivitigalakele Conductor.*—Decided to terminate services of the present officer and advertise for a successor.

(b) *Compost Manure.*—Decided that an experiment on the use of compost should be carried out as soon as circumstances permit.

(c) *Buildings at Culloden.*—Decided that the question of demolition of the buildings should be postponed.

(d) *Supplementary Estate Votes.*—

The following votes were approved:—

Repairs to bridge ...	...	Rs. 545
Erection of cattle shed ...	...	,, 600
Construction of tennis court	...	,, 472
Construction of cattle bridge	...	,, 65
Increased remuneration to the Dispenser at Rs. 5 per month ...		,, 60

6. MANUFACTURE OF VULCANISED PRODUCTS AT DARTONFIELD

Consideration was given to the desirability of manufacturing vulcanised products at Dartonfield for sale, in addition to rubber tubing which is now being made.

It was considered that manufacture on a small scale forms a useful demonstration of the possibilities of local manufacture and should be extended to other articles so far as this can be done without undue interference with other branches of work. Publicity should be given to the work so that anyone interested can obtain the necessary information to take up manufacture on a commercial basis.

7. AMENDMENTS TO RUBBER RESEARCH ORDINANCE

The Chairman reported that the following amending Ordinances had been passed:—

No. 35 of 1935—making provision for the transfer of the lease of Nivitigalakele to the Rubber Research Board.

No. 3 of 1936—enabling the Rubber Research Board to hold patents.

8. LETTER FROM CRUDE RUBBER COMMITTEE OF AMERICAN CHEMICAL SOCIETY

A letter from the Crude Rubber Committee of the American Chemical Society requesting information regarding the methods of manufacture employed by small-holders in Ceylon and suggesting a scheme of standardisation of coagulants employed, was considered together with the Director's suggested reply thereto. It was agreed that the reply should be sent.

9. SULPHUR DUSTING MACHINES

It was decided to recommend to Government that the machines used for the sulphur dusting demonstration in 1936 should be sold.

RUBBER RESEARCH SCHEME (CEYLON).

Minutes of the thirty-seventh meeting of the Rubber Research Board held at the Grand Oriental Hotel, Colombo at 10 a.m. on Tuesday, the 16th March, 1937.

Present.—Mr. E. Rodrigo, C.C.S. (in the chair), Mr. C. H. Collins, C.C.S. (Acting Financial Secretary), Mr. I. L. Cameron, Mr. L. M. M. Dias, Mr. L. B. de Mel, J.P. U.P.M., Mr. F. H. Griffith, M.S.C., Col. T. G. Jayewardene, V.D. Mr. J. C. Kelly, Mr. F. A. Obeyesekere, Mr. J. L. D. Peiris, Mr. C. A. Pereira, Mr. B. M. Selwyn and Col. T. Y. Wright.

Mr. T. E. H. O'Brien, Director, was also present by invitation.

Apologies for absence were received from Mr. George E. de Silva, M.S.C. and Mr. R. C. Kannangara, M.S.C.

1. MINUTES

Draft minutes of the thirty-sixth meeting which had been circulated to Members were confirmed and signed by the Chairman.

2. APPLICATION FOR GRANT FROM THE DEPARTMENT OF INDUSTRIES

The Chairman reported that a letter and memorandum of the facilities available for training students which had been submitted to Board members for approval by circulation of papers, had been forwarded to the Minister for Labour, Industry and Commerce. No reply had yet been received.

Arising from consideration of the memorandum it was decided to re-appoint a Budding Instructor owing to the large demand for training of estate employees in budgrafting. It was arranged that the former Instructor who had been transferred to other duties in 1935 owing to lack of demand for training in budgrafting, should be detailed for the work and a temporary officer appointed to undertake his present duties.

3. ACCOUNTS

(a) *Statements of Receipts and Payments of the Board and the London Advisory Committee for the quarter ended 31st December, 1936* — were adopted.

(b) *Dartonfield and Nivitigalakele Accounts for December, 1936* — were tabled.

(c) *Supplementary Votes for 1936.*—Supplementary votes totalling Rs. 3,172 were passed to cover over-expenditure of 1936 votes, after consideration of the Director's explanations as stated in the Auditor's Report.

(d) *Income and Expenditure Account, Balance Sheet and Auditor's Report for 1936.*—The statement of accounts and auditor's report which had been circulated to members, were adopted.

(e) *Revote of Balances of Votes on Capital Account Unexpended in 1936.*—Revotes totalling Rs. 20,434 were approved after consideration of the reasons for non-expenditure of the entire votes in 1936.

(f) *Fixed Deposits.*

Renewal of the following deposit was reported:—

Rs. 30,000 at the Chartered Bank of India, Australia and China for 1 year at 1¾ per cent.

It was decided that the funds standing to the credit of the Provident Fund account and now on fixed deposit should be transferred to an investment carrying better interest. Mr. C. H. Collins (Acting Financial Secretary) agreed to advise on the nature of the investment.

4. REPORTS

(a) *Annual Report for 1936.*—The report for 1936 was adopted subject to minor amendments and it was decided to publish the report as in previous years.

(b) *Technical Officers' Reports for the Quarter October/December, 1936.*—Adopted.

(c) *Mr. R. K. S. Murray's Report on Visit to Malaya and Netherlands East Indies.*—It was decided to publish the report as a bulletin and in the meantime it was agreed that advance copies should be forwarded to Agency Houses and to the Planters' Association of Ceylon, the Ceylon Estates Proprietary Association and the Low-Country Products Association.

The Board decided to record its appreciation of the thorough and efficient manner in which Mr. Murray had fulfilled the purpose of the mission and to thank him for his very interesting report.

(d) *Visiting Agent's Report.*

1. It was decided to adopt the recommendation to manure half the estate annually.

2. In the course of discussion on decrease of crop in 1936 a suggestion was made that tapping was too shallow at Dartonfield and on other local estates. Mr. Murray had commented in his report on the greater attention which is given to this point in other producing countries. The Director was asked to consider the advisability of preparing a leaflet on the subject.

3. It was agreed that yield figures from the area set aside for study of forestry cultivation should be shown separately in the Estate Superintendent's reports.

5. STAFF

(a) *Technical Staff Requirements.*—Arising from preliminary discussion of the subject at the previous meeting, the Chairman stated that a memorandum had been circulated to members showing the financial position of the Scheme and the additional expenditure which would be incurred if it was decided to appoint a Soil Chemist and a Geneticist.

Members agreed that both appointments were urgently necessary if funds were available. After considerable discussion it was decided that the financial position did not warrant the appointment of both officers at the present time and it was decided to appoint a Geneticist.

It was agreed to advertise the vacancy locally and abroad on the terms of service and salary scales previously approved, with initial salary according to qualifications and experience. The Chairman was authorized to take all necessary steps in connection with the appointment.

(b) *Nivitigalakele Conductor.*—The appointment of Mr. M. Thursen de Silva was reported and approved.

6. SULPHUR DUSTING SCHEME

The Chairman reported that a letter had been received from the Minister for Agriculture and Lands stating that the scheme should be wound up and the balance of the grant refunded to the Rubber Restriction Fund if the Board considered that it had fulfilled its duties in relation to the control of oidium.

In accordance wtih the letter the dusting machines had been sold by public auction realising an average price of Rs. 355 which was considered satisfactory. A statement of receipts and payments was submitted showing a surplus of Rs. 7,166·36 and it was agreed that the amount should be refunded to the Rubber Restriction Fund.

7. EXPERIMENTAL COMMITTEE

The following decisions were reached regarding recommendations of the Committee.

(a) *Visiting Agent's Reports.*—Three visits to be made annually as at present but only one comprehensive report submitted.

(b) *Supplementary Votes for Buildings in 1937 Programme.*—Owing to increases in the price of building materials it was decided to increase the votes by 5 per cent. A sum of Rs. 2,800 was voted for the purpose.

(c) *Estate Office.*—It was agreed that the estate office should be of the same type as the other buildings and the vote was increased from Rs. 2,500 to Rs. 4,000.

(d) *Water Pumping System.*—A sum of Rs. 1,283 was voted for the purpose of purchasing spare parts.

(e) *Power and Water Supply for Nivitigalakele.*—A sum of Rs. 7,750 was voted for the installation of a generator and pump.

8. PUBLICATIONS

Consideration was given to a suggestion that an advertisement should be issued in the local press reminding estates of the need for annual renewal of registration.

After discussion it was decided that publications should be issued free of charge to Proprietors (resident in Ceylon), Superintendents and local Agents of Rubber estates of over 10 acres in extent who apply for registration, without the need for annual renewal of registration. In the case of large estates additional copies of publications should be supplied if required for the use of Assistants.

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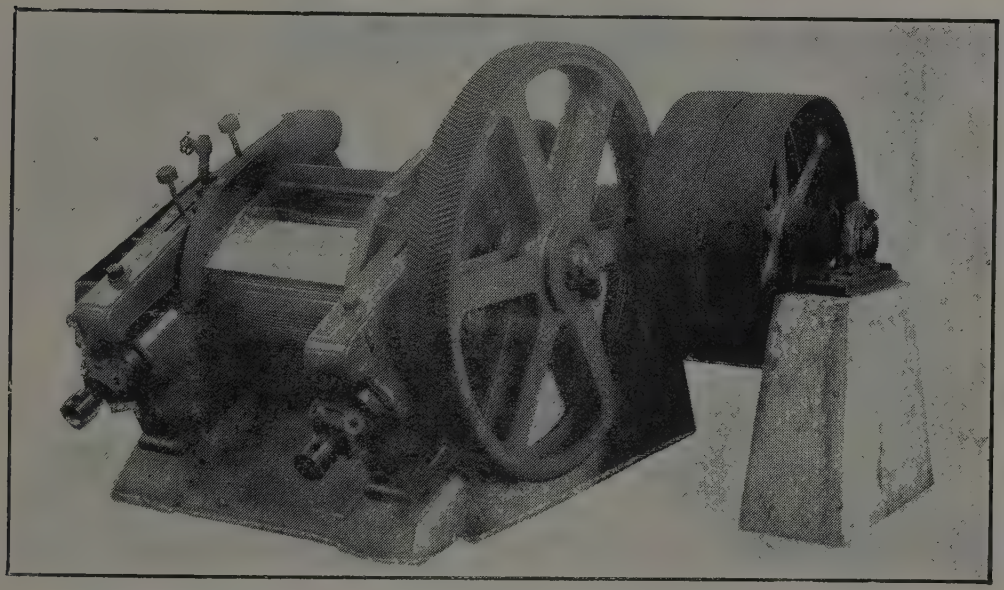

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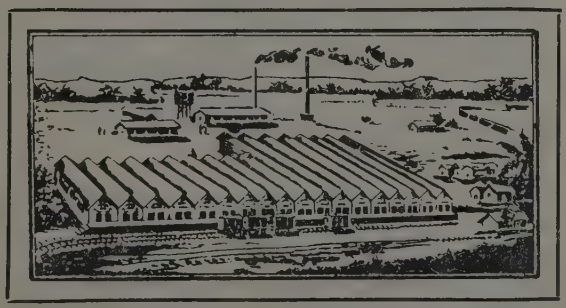

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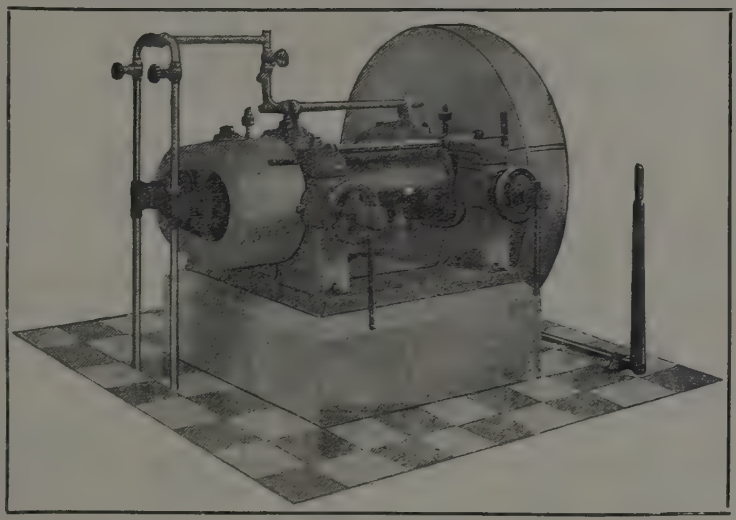

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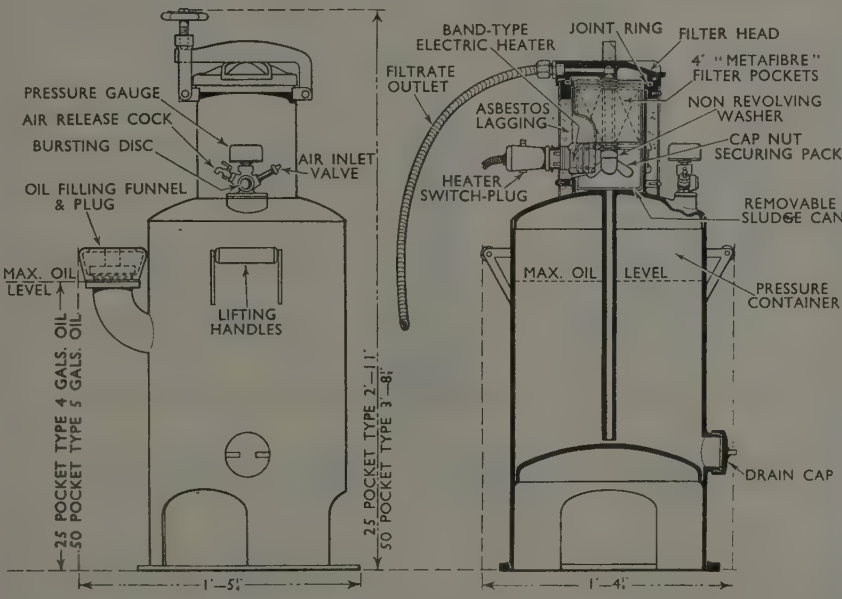

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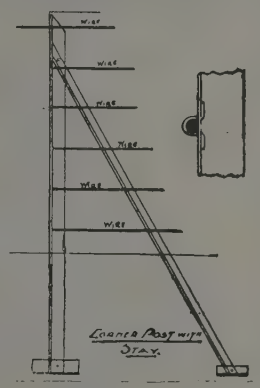

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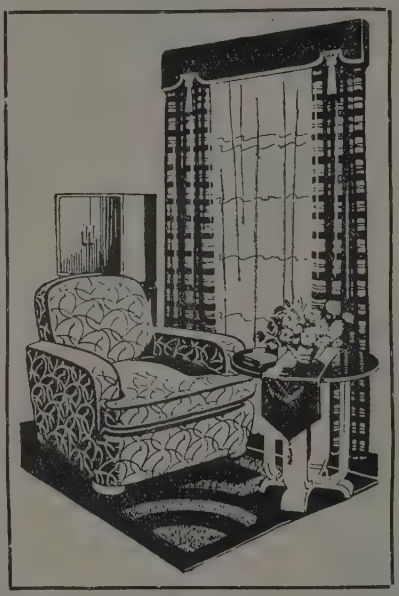

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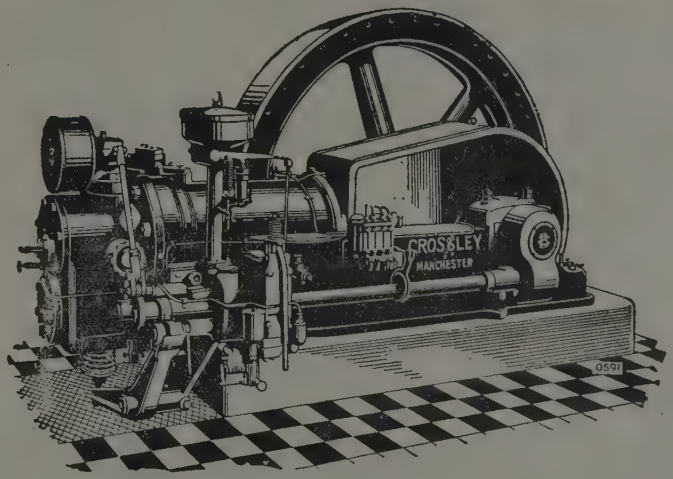

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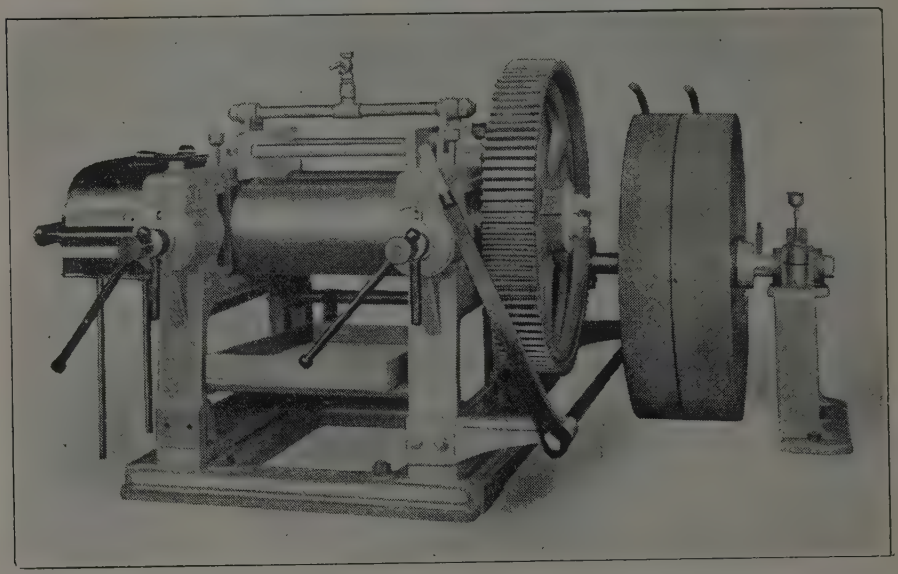

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